

V.3.3-TATUM TATUM ROUTING OPERATION

Identifier: TATUM

Application: All programs

Description: Tatum coefficient routing can be used to apply a constant lag to flow when the desired lag is equal to or a multiple of the ordinate spacing. This method also has the ability to variably attenuate flow in a reach because of different coefficients for different layers. Therefore, this method can be applied at a point to account for attenuation in a channel system above a headwater gage. A limitation of this method is that it is not closely tied to the physical processes or river hydraulics within a reach.

The sum of the Tatum coefficients for a given layer usually is 1.0. If the sum of the coefficients does not equal 1.0 then a percentage loss or gain occurs in the reach.

A complete description of this Operation is in Chapter II.4-TATUM.

Allowable Data Time Intervals: 1, 2, 3, 4, 6, 8, 12 and 24 hours

Time Series Used:

General Type	Dimn	Units	Use	Required	Form of Output T.S.	Data Time Interval	Missing Values Allowed
Inflow	L3/T	CMS	I	yes	n/a	any	no
Outflow	L3/T	CMS	O	yes	additive	<u>1</u> /	yes

1/ Must be greater than or equal to the data time interval of inflow time series.

Input Summary: The card input for this Operation is as follows:

Card	Format	Columns	Contents
1	5A4	1-20	General information for this Operation
	2X,2A4	23-30	Internal identifier for the inflow time series
	1X,A4	32-35	Data type code for the inflow time series
	3X,I2	39-40	Time interval for inflow time series

<u>Card</u>	<u>Format</u>	<u>Columns</u>	<u>Contents</u>
	2X,2A4	43-50	Internal identifier for outflow time series (blank if routing at a point)
	1X,A4	52-55	Data type code for outflow time series (blank if routing at a point)
	3X,I2	59-60	Time interval for outflow time series (blank if routing at a point)
	2X,I3	63-65	Number of layers
	4X,I1	70	Carryover control indicator: 0 = all carryover equal zero by default 1 = carryover read from data cards
2	7F10.0	1-70	Number of Tatum coefficients for each layer beginning with bottom layer

Card 3 is not needed if there is only one layer.

3	7F10.0	1-70	Upper limit of flow for each layer beginning with the bottom layer (CMS) - there is no upper limit for the top layer
4	7F10.0	1-70	Tatum coefficients for a layer - first coefficient is at time zero - repeat card 4 as many times as needed to read all coefficients for a layer

Repeat Card 4 for each layer.

Card 5 not needed if the carryover control indicator on Card 1 is equal to zero.

5	7F10.0	1-70	Initial carryover for a layer (CMS). The carryover for a layer is the n-1 previous inflows for the layer where n equals the number of Tatum coefficients for the layer. If there is only one Tatum coefficient for a layer, card 5 is not needed for that layer. The carryover for the bottom layer is input first.
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Repeat Card 5 for each layer with more than 1 Tatum coefficient.

Sample Input and Output: Sample input is shown in Figure 1. Sample output from the parameter print and carryover print routines is shown in Figure 2. There is no output from the execution routine.

Error and Warning Messages: The error and warning messages generated by this Operation and the corrective action to take when they occur are as follows:

1. ****ERROR**** OUTFLOW TIME INTERVAL = XX HOURS IS LESS THAN THE INFLOW TIME INTERVAL = XX. THIS IS NOT ALLOWED FOR THIS OPERATION.

Action: Use an outflow time interval that is greater than or equal to the inflow time interval.

2. ****ERROR**** THE NUMBER OF LAYERS IS ZERO.

Action: Check the input data to insure that the number of layers is non-zero.

3. ****ERROR**** THE NUMBER OF TATUM COEFFICIENTS FOR A LAYER IS ZERO.

Action: Check input data and make sure that the number of coefficients is not zero for all layers.

4. ****ERROR**** FLOW RANGES FOR LAYERS ARE NOT IN INCREASING ORDER.

Action: Put the maximum flows per layer in increasing order.

5. ****WARNING**** COEFFICIENTS PER LAYER DO NOT TOTAL TO 1. A LOSS OR GAIN OCCURS IN THE REACH.

Action: Revise Tatum coefficients if a gain or loss is not intended.

Carryover Transfer Rules: Since carryover for each layer is the most recent inflows for the layer, the total inflow for the previous time periods can be totally or partially reconstructed. Using these reconstructed total inflows and the new parameters, an estimate of the new carryover values can be determined. This carryover transfer process may not be exact; thus, it could take several time intervals before the effect of the old carryover on the new parameters is no longer noticeable.

Punch Card Limitations: The punched card formats for this Operation are as follows. No checks are made to determine if quantities are greater or less than the maximum and minimum values.

<u>Parameters or Variables</u>	<u>Punch Format</u>	<u>Maximum Value</u>	<u>Precision After Decimal Point</u>
Coefficients	F10.3	999999.999	thousandths
Flow Limits	F10.3	999999.999	thousandths
Carryover	F10.3	999999.999	thousandths

Figure 1. Sample Card Input For Operation TATUM

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                    - Column -
      5   10   15   20   25   30   35   40   45   50   55   60   65   70   75   80
-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
ROUT MTNNC TO FEENC MTNNC SQIN 6 MTNNCRTD SQIN 6 2 0
      6.000      7.000
    300.000
      0.075      0.200      0.275      0.250      0.150      0.050
      0.020      0.180      0.250      0.225      0.175      0.100      0.050
  
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Figure 2. Sample Output From Operation TATUM Print Parameter And Print Carryover Routines

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TATUM COEFFICIENT ROUTING FOR REACH ROUT MTNNC TO FEENC
COMPUTATIONAL TIME INTERVAL IS 6 HOURS
NUMBER OF LAYERS 2
      TIME SERIES USED BY THIS OPERATION
CONTENTS          I.D.          TYPE          TIME INTERVAL
INFLOW            MTNNC          SQIN          6 HOURS
OUTFLOW          MTNNCRTD        SQIN          6 HOURS
LAYER            RANGE (CMS)          COEFFICIENTS
  1  Q LESS THAN  300.000      .075 .200 .275 .250 .150 .050
  2  Q GREATER THAN 300.000      .020 .180 .250 .225 .175 .100 .050
INITIAL CARRYOVER VALUES WERE SET TO ZERO BY DEFAULT
  
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